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ABSTRACT

Thirty-two educable mentally retarded (EMR) and 32 nonretarded adolescent Ss were administered an association task and the Peabody Picture Vocabulary Test to determine aspects of verbal deficit, often the basis for placement of EMR students in special classes. The association task required an S to give up to 25 associations for each of 10 verbal stimuli. The associations were scored for quantity and speed of response, and were categorized by a modification of J. Flavell's system for measuring response quality. The two groups differed in vocabulary size, as expected. When the association data was corrected by vocabulary size, relatively few differences between EMR and non-EMR Ss remained. Data showed that the EMR Ss were slower in the first and continuing response(s) to the association stimuli, used fewer logical associations, and used fewer responses with vocational connotations. After adjustment for vocabulary differences in the two groups differed only on five of the 24 measures examined, thus showing comparable associative networks. Other differences demonstrated a specific deficit of EMR Ss in logical connections and in speed of access to the associative net. (Author)

STUDIES IN LEARNING POTENTIAL

DIFFERENCES BETWEEN EDUCABLE MENTAL RETARDATES AND NONRETARDATES IN FLUENCY AND QUALITY OF VERBAL ASSOCIATIONS

By

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Summary

An association task, in which S was asked to give up to 25 associations to each of ten verbal stimuli, was administered to 32 educable mentally retarded subjects and 32 nonretarded subjects, along with the Peabody Picture Vocabulary Test. The associations were scored for quantity and speed of response; they were also categorized by a modification of Flavell's system for response quality. The two groups differed in vocabulary size, as expected. When the association data was corrected by vocabulary size relatively few differences between EMRs and nonEMRs remained: EMRs are slower than nonEMRs in their first and continuing responses to the association stimuli, use fewer logical associations, and use fewer responses with vocational connotations. In the light of the fact that after adjustment for vocabulary differences the two groups differed only on five of the 24 measures examined, the associative networks of the two groups are surprisingly comparable. The remaining differences demonstrate a specific deficit in logical connections and in speed of access to the associative net.

Differences Between Educable Mental Retardates and Nonretardates in Fluency and Quality of Verbal Associations[1]

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The aim of the present study is to explore some aspects of the verbal deficit which traditionally has been the basis for separating out a group of educable mental retardates (EMRs - IQ 60-80) from the general school population. In schools as they currently exist, verbal facility (upon which IQ measures are largely based) has been the sine qua non for academic success. Traditional measures of verbal facility have two major components: one involves knowledge of vocabulary; the other involves competence with systematic manipulations of words as in verbal reasoning and comprehension tests. EMRs are known to have smaller vocabularies than nonEMRs subjects. While verbal reasoning and comprehension tests depend in part on vocabulary size, they may depend on other factors as well.

One of these factors, a possible prerequisite for adequate verbal reasoning and comprehension, is that of having learned rich and consensual associative connections between words. The purpose of the present study is to explore the extent of the EMR's verbal deficit in quantity and quality of associative connections, controlling for vocabulary size. The method used to explore this question, the multiple response free association procedure, yields data on speed, productivity, variety of content, and quality of associative connections.

Previous work comparing the verbal productivity of EMRs and nonEMRs in association types of tasks is limited. Conceptually, the multiple word association task is similar to tests of Guilford's Factor DMU -- the ability to produce large numbers of divergent (each different) semantic units under loose conceptual constraints. There is no direct evidence in the research literature that EMRs are differentially any more or less inferior to normals on this ability as compared with other abilities. Meeker (1969) reports that EMRs have generally lower profiles on Guilford's Structure of Intellect factors than do nonEMRs. From this evidence we should expect that EMRs should be inferior to normals in the quantity of word associations they can produce. A related ability, that of producing divergent responses under tight conceptual constraints, has been shown by Gordon and Gordon (1967) to differentiate between EMRs and normals. Neither of these approaches has demonstrated a deficit in verbal production when corrections are made for vocabulary size.

The rate at which associations are produced may well differentiate between EMRs and normals. EMRs generally have slower reaction times on motor tasks than do normals (Baumeister & Kellas, 1968). In word association tasks, Wolfensberger (1963) found that EMRs had consistently longer response latencies than normals. Moran, Mefford, and Kimble (1964) factor analyzed a number of different types of word association responses in a group of normal adults. They found a factor (their Factor I) which loaded positively on education and vocabulary but nega-

tively on inability to respond, reaction time, and inability to remember one's previous association. If education and vocabulary can be taken as indirect measures of IQ, this finding indicates that low IQ clusters with long associative reaction times. Keilman and Moran (1967) have shown that high and low grade mental retardates (IQs of 65 and 45 respectively) differ from each other in mean associative reaction time. These findings leave open the question of whether for word association tasks the EMR's reaction time deficit is independent of vocabulary size. The factor analytic work cited above suggests that reaction time and vocabulary size may be facets of the same underlying dimension.

The quality of word association responses is difficult to assess. Early studies (e.g., Horan, 1956) which had little theoretical superstructure for defining quality of response, generally failed to find large differences in the association hierarchies of normal children, mentally retarded children, and adults. With increasing theoretical sophistication, however, differences between normals and retardates have emerged. However, none of these differences has been demonstrated to operate independently of vocabulary size.

One of the most easily quantified measures of response quality has been response commonality. This is defined as the relative frequency with which the response is used by a normative group as a response to a given free association stimulus. Some measures of this attribute have concentrated on the extremes of this continuum: Is S's response the popular response? Is S's

response a unique one? Other studies regard it as continuous. Previous studies, cited by Cramer (1968), using the method of discrete single stimulus presentations, have shown that commonality of response is positively correlated with IQ through most of the IQ range (50-125) in the first 9 grades of school. No studies have related commonality of response to IQ using the multiple response association method of the present study. However, it would seem likely that the idiosyncratic end of the commonality continuum would be more sensitive to IQ differences than the popular response end. In multiple response association tasks, the probabilities are high that the popular responses will be used: if not in the first trial then in some succeeding trial (Brody, 1964). In the present study we investigate the differential presence of idiosyncratic responding.

A second way of looking at response quality is by estimating the number of associative links between stimulus and response. This view derives both from the genetic approach of Heinz Werner and from the theorizing of Rapaport as developed by Flavell (1957) which defines mature, secondary process thinking in terms of delay of response and trial and error searching for responses that meet adaptive requirements. Primitive thinking, in this view is defined by immediate response, fewer transformations between stimulus and response, and responses that violate task requirements. The most primitive of responses, in this view, is repeating the stimulus word. This requires no associative transformation and does not adaptively meet the task requirements. In this regard, Silverstein and McLain ( )

found a negative correlation between IQ and frequency of stimulus repetition in a moderately retarded (mean IQ of 55) sample. The next most primitive stage is that of giving a response which sounds like, or rhymes with the stimulus, the "clang" association. Luria and Vinogradova (1959) using a generalization of conditioned response technique, found that severe retardates generalize to the sound but not the meaning of stimulus words; EMRs generalize both to sound and meaning; and normals generalize primarily to the meaning of the stimulus and not its sound. A third stage of complexity, involves the use of nonrhyming words which often follow the stimulus word in conversational usage. Since words which immediately follow each other in sentences are seldom of the same grammatical category, this contrast in grammatical forms (syntagmatic response) is often used as an operational definition of this stage. The syntagmatic response has been found in normal children under the age of 6, Ervin (1961), Entwhistle (1966), and Kagan (1964); children over 6 use identical grammatical forms (paradigmatic response). The failure of many studies to differentiate between EMRs and normals on this variable may be related to the relatively low mental age at which the transition takes place or to the fact that the contrast in grammatical forms is a poor operational definition of a use of high style based on conditional probabilities in spoken language. Further distinctions within paradigmatic responding suggest categories of increasing amounts of intervening processing of the stimulus: from antonym and contrast responses

(hot-cold) to logical categorizations (subordinates, supraordinates) to synonyms and coordinates (another instance of the same category). The correlations of usages of these more complex categories with IQ are generally positive but vary in significance level from study to study (see Cramer, 1968).

Factor analytic work on measures of response quality has been done by Keilman and Moran who have found a common three-dimensional factor structure shared by normals and EMRs but not by moderate (IQ of 50) retardates. The first of these factors contrasts logical responding and commonality with response faults (reaction time, forgetting one's response); a second factor comparing contrast and coordinate responses with predication (noun-adjective) responses, and a third factor describing functional responding (noun-verb).

In view of the diversity of qualitative systems for classifying word association responses, and in view of the exploratory use of the multiple response technique with EMRs in this study, we decided not to restrict ourselves to a single theoretical framework. We used many of the commonly accepted response categories borrowing mainly from the work of Flavell, but also from the formulations of Keilman and Moran.

Method

Subjects. A total of 64 Ss, 32 EMRs and 32 nonEMR controls served as Ss for this study. Half of the Ss in each group were male and half female. Each of the four EMR x Sex subgroups were drawn in equal numbers from two junior high schools in a large

urban school system (Boston), making a total of eight subgroups, with eight Ss in each (EMR x Sex x School) subgroup. All Ss were white, from urban,working-class neighborhoods with a mean age of 14 years, 3 months. Table 1 summarizes some of the background information on the subgroups, and indicates that there were no differences between subgroups on age, but that the EMRs score significantly lower than nonEMRs in IQ, reading competence, and Peabody Picture Vocabulary Test score (PPVT). In addition, it was found that pupils from School G were significantly inferior to those from School C with respect to reading competence.

Insert Table 1 about here

Stimuli. The ten words used for the multiple association test were selected from the Kent-Rosanoff (1910) stimulus list with several criteria in mind. First, they were judged to be fairly neutral in emotional content. Second, in order to represent a wide range of task difficulty, words were selected to represent the entire range of response dispersion. A convenient measure of degree of response dispersion, the information statistic H_i^2 was computed from the Russell and Jenkins (1954) norms for the distribution of first associative responses for each of the Kent-Rosanoff stimuli. The stimuli used in the study are listed in Table 2 along with their H values. For example, the H vlaue for the stimulus "table" is low because there is one dominant response, "chair", which was given by

840 of the 1008 Ss in the normative sample. The H value for "memory" is high because no one response is clearly popular or dominant.

Insert Table 2 about here

Procedure. Each S was administered the 10 stimulus list individually and encouraged to produce up to 25 associations to each stimulus word. Order of stimulus presentation was varied from one S to the next within each group by an incomplete Latin Square design.[3] The counterbalancing for order and sequence effects, although not complete, made it unlikely that the results could be attributed to specific orders of stimulus presentation. The word association task itself was introduced by the following instructions:

> Today we're going to try a new kind of word game. I am going to say one word to you, and I want you to say the first word that comes into your head right afterwards. Your word has to have something to do with my word. Then, I will say my word again and you will say a different word from what you said before. The idea is for you to say a different word each time. . . Let's start now. Remember, say a different word each time and make sure your word has something to do with my word. Try to think up as many different words as you can but just say only one word each time I say my word.

E proceeded through each stimulus word (repeating the stimulus after each response in order to encourage association to the stimulus and not the previous response) until S had given a total of 25 responses or until he paused for 20 seconds, at which point E repeated the stimulus word. If no response emerged in the following 20 seconds, E discontinued that stimulus word and went on to the next. Repetitions of previously given responses and multiword responses (e.g., "dining room table" to the stimulus "table") were recorded but implicitly rejected by a request from E such as,"Remember, just one word." Neither of these latter types of response were counted towards the total of 25.[4] The entire procedure required approximately 35 minutes to complete. After the individual administrations of the free association task had been completed, the Peabody Picture Vocabulary Test (PPVT) was group-administered to the classes from which Ss came.

Scoring. Two types of measures were developed for assessing S's response to the free associations procedure: quantitative and qualitative. Quantitative data on (1) number of acceptable responses, (2) number of unacceptable responses, (3) log initial reaction time, (4) total reaction time, (5) time per response, (6) number of 20-second pauses before the final one, (7) response number at which first 20-second pause occurred, and (8) number of abrupt shifts in associative content. Since criteria for the assessment of the first seven measures were clearly stated, reliability

was assumed to be very high and not checked. Reliability on the abrupt shift criterion was assessed by two raters assessing 40 stimulus words from four protocols. The inter-rater correlation was .90.

Responses were also categorized qualitatively by a system of classification similar to that used by Flavell and Draguns (1956). In this system responses are generally categorized as superior, ordinary, or inferior. Definitions and examples of these categories are given in Table 3. Reliability of scoring was assessed among three raters for each category using the entire response list for each of the stimulus words. Kendall's W was computed for each category (see Table 3) and found to be significant well beyond the .001 level throughout; agreement, however, was far from perfect. Final agreement on categorization of responses on which there was disagreement was arrived at by extensive discussion among the three raters.

Group administration made the scoring of the PPVT somewhat complicated. One group of EMRs in School G received the first 105 items of Form A, on the assumption that 105 was a reasonable group ceiling. A second group of EMRs at School G received 110 items. All the nonEMRs in both schools and the EMRs in School C received 125 items. Since difficulty levels of the items in our sample were quite different from those given by the standardization norms, the order of item presentation did not proceed from easy to difficult, and standard criteria for ceiling (that point at which 2 of 8 are correct) were inapplicable, which in turn made the IQ norms inappropriate. Instead, each S's PPVT score was computed as the number of items

correct in the set of items administered, plus 1/4 (chance expectation) of the number of items not administered.

Results

Table 4 presents the means and standard deviations, for the eight quantitative measures of response-productivity, variety, and rate to the 10 stimuli. Table 5 presents the relevant analysis of variance in summary form both uncorrected and corrected (2 covariates) for age and vocabulary size. The main comparison of interest is that between EMRs and nonEMRs. Uncorrected F ratios for 3 of the 8 measures (number of acceptable responses, log initial reaction time, time per response) differentiate, in the expected direction, between the two groups at the .01 level of confidence and beyond. When the data corrected for age and vocabulary size, the F ratios for the EMR comparison are drastically reduced, although two of these remain significant at the .01 level (log initial reaction time, and time per response). What is noteworthy, however, is that the remaining differences between the two groups relate to speed of response rather than quantity, or variety of content.

Other significant differences between groups are for the EMR x Sex interaction which is significant (uncorrected or corrected by age and vocabulary size) for three of the eight measures at the .05 level. The EMR male group gives a higher number of unacceptable responses; the EMR female group has the shortest total response time and the longest time per response. Other

noteworthy and probably nonchance results are the significant F ratio for the difference between schools on initial reaction times, and, on the same measure, the Sex x School interaction. Ss in School G (who were generally more familiar with E) had longer initial reaction times than Ss in School C. The shortest reaction times were obtained by girls in School C.

F ratios for differences among words are significant beyond the .05 level in 6 of the 8 response measures. The differences among words on the measures were not generally related to their H value in any simple (linear, quadratic, cubic) way, indicating that for the present task, H value was not of crucial importance to the response measures examined.

The presence of only one significant interaction of Words x EMR Status (for the number of acceptable responses) indicates that, generally, EMRs and nonEMRs do not react differentially to the various words. Boys and girls, on the other hand, appear to have quite different response profiles to the different words: 5 of the 8 Words x Sex interactions are significant. Words that make boys hesitate are easy for girls and vice versa. Several other significant interactions of group membership with words are scattered through the data, but are not easily interpreted.

Measures of response quality. It will be recalled that the responses given by S to each stimulus word were categorized by type and were placed in one of 16 response categories. Tables 6 and 7 give the mean number of responses per stimulus word

in each category for each of the 8 groups. Tables 8 and 9 present the corresponding analyses of variance with and without adjustment for age and vocabulary size. Parallel analyses of variance were also performed on the data expressed as percentages of the total number of responses S gave to each word. The results of these analyses were very similar to those reported here.

As in the data for the quantitative measures of word association performance, the covariance technique extracted a considerable portion of variance from the data. The F ratios for the regression of the data against age and vocabulary size are significant beyond the .01 level for all measures. The covariates have a general tendency to reduce the significance of F ratios connected with the EMR variable, but to increase them for other sources of variance. Before correction for age and vocabulary size, 9 of the 16 qualitative measures differentiate between EMRs and nonEMRs: Supraordinates, Subordinates, Synonyms, Noun Attributes, Verb Attributes, Adjective Attributes, Actor Responses, Emotional Responses, and Multiword Responses. In all but the last instance (multiword), EMRs have fewer responses than nonEMRs. After correction for age and vocabulary size, only four measures differentiate between the groups: Supraordinates, Subordinates, Actor Responses and Multiword Responses. With the exception of the Subordinate category, these categories are used by all subjects fairly infrequently.

Other significant F ratios in the between groups analysis are relatively uninterpretable, with some important exceptions.

None of the F ratios for the main effect of Sex, are significant. Three of the F ratios for the main effect of school are significant at the .05 level in the covariance analysis: Coordinates, Emotional Responses, and Distant Responses(all School G). None of the Sex x School interactions are significant, and two measures (both corrected and uncorrected) are related to a complex EMR x Sex x School interaction: Miscellaneous and Distant Responses.

Four of the EMR x School interactions are significant in the uncorrected analysis, and six in the corrected analysis: Noun Attribute (both); Verb Attribute (both); Adjective Attribute (corrected only); Distant (both); Repetitions (both); and Multiword Responses (corrected only). These interactions suggest that either the selection criteria for special classes are different in the two schools or that subsequent verbal experiences are different in the two schools in either regular or special classes or both. Inspection of the means indicates that it is the EMRs in School C who are especially inferior in giving any type of attributes; the EMRs from School G who give most distant responses and repetitions, and the EMRs from School C who give the most multiword responses. These results are consistent with the greater familiarity of the EMRs in School G with the examiners.

Three of the measures (Noun Attribute, Actor Response, and Repetitions) indicate an EMR x Sex interaction in both the uncorrected and corrected analyses. The female EMR group gives by far the lowest number of noun attribute and actor responses. Both the female EMRs and male nonEMRs give low numbers of re-

petitions.

Analysis of the within-subjects data shows that different stimulus words evoke different kinds of responses. The F ratios for stimulus words are significant for all but three of the sixteen response measures (Clang, Multiword, and Distant). The amount of response in each of the significant categories is not systematically related to the stimulus word's H value. Clearly, stimulus parameters other than H value are operating to produce the differences among responses to stimulus words. Seven of the 16 response measures indicate significant differences between EMRs and nonEMRs in the capacity of the 10 stimulus words to produce responses in these significant categories. The seven measures are: Supraordinates, Noun Attributes, Coordinates, Adjective Attributes, Actor Responses, Emotional Responses, and Completions.

Analysis by Learning Potential Status. Budoff and Friedman's (1964) method for assessing learning potential status (via the Kohs Block Designs) was used to divide the EMR sample into three groups: those whose Kohs scores were initially high (High Scorers); those whose low initial score improved dramatically after training on principles relevant to constructing Kohs designs (Gainers); and those whose low initial scores showed little change after instruction (Nongainers). These groups were further subdivided into two orthogonal comparisons: Nongainers vs. Gainers and High Scorers; and Gainers vs. High Scorers. The subdivided EMR data was then

used in new analyses of variance against the 24 verbal criteria both as a main effect an in interaction with sex. Using the error terms from the main analyses reported above, the results of this analysis yielded 96 uncorrected F ratios of which only one was significant at $p < .05$. The analyses of covariance (using age and vocabulary as covariates) yielded six significant F ratios out of the 96 computed. The data approximate the chance model for the F distribution much too well to be interpreted further.

Discussion

The main results of the study are that, after correcting for vocabulary size, differences remain between EMRs and non-EMRs both on the quantity and quality of responses to a multiple-response free association task. Closer examination of the quantitative differences, when corrected for vocabulary size, however, suggests that the differences in performance are restricted to rate of responding rather than to quantity or variety of associations. The classic notion of the mental retardate as "slow" is literally confirmed in this study. It takes more time for the EMRs to think of both the first and succeeding responses.

The qualitative data would seem to demonstrate the inferiority of EMRs in giving logical associative connections to the stimulus words even after correction for age and vocabulary. Two of the three logical categories (supraordinates and subordinates) are used less frequently by EMRs than by nonEMRs. In fact, for the supraordinate category, the difference between EMRs and nonEMRs

is more pronounced after the correction for vocabulary size than before. This result is in line with Wallace's (1965) finding that EMRs, more than nonEMRs, confuse logically related words with actually presented words when tested by a technique of recognition recall, and with the results of verbal reasoning tests. The largest difference between the two groups is in the "Actor" category which picks up many of the vocational roles connected with the stimulus words. EMRs do not think of vocational, "doing" roles in connection with many of the stimulus words. This result is probably a consequence of the vocational and academic constriction which EMRs experience, particularly while they are in school.

The failure of Learning Potential Status to predict proficiency in the word association tasks is not surprising in the light of the verbal nature of the present task. Outside the verbal area, learning potential is a powerful predictor of nonverbal abilities, emotional response, and social adjustment. The failure to find significance here confirms the idea that it is primarily/ deficiency in the verbal area which determines special class placement.

Footnotes

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[2]The H statistic (see Attneave, 1960) is affected by both the number of different responses to a stimulus word and the degree to which all of the responses are given with equal frequency. Many studies (e.g., Lafall, 1955, Levinger and Clark, 1961) attest to the utility of the H statistic in predicting response faults (GSR, delayed reaction time, reproduction errors in a second administration, etc.) in free association tasks.

[3]The original plan was to test 10 Ss in each group and thus fill out a Latin Square balanced for order and sequence effects. The unavailability of additional Ss made this plan unfeasible.

[4]Multi-word responses were, in the end, analyzed as a separate qualitative response category.

References

Attneave, F. Applications of Information Theory to Psychology. New York: Holt, 1959.

Baumeister, A., & Kellas, G. Intrasubject Response. Research in Mental Retardation, New York: Academic Press, 1968.

Brody, N. Anxiety and the variability of word associates. Journal of Abnormal and Social Psychology, 1964, 68, 331-334.

Budoff, M., & Friedman, M. Learning Potential as an assessment approach to the adolescent mentally retarded. Journal of Consulting Psychology, 1964, 28, 434-439.

Cramer, P. Word Association. New York: Academic Press, Inc., 1968.

Entwhistle, D. R., Forsyth, D. F., & Muus, R. The syntactic-paradigmatic shift in children's word associations. Journal of Verbal Learning and Verbal Behavior, 1964, 3, 19-29.

Ervin, S. M. Changes with age in verbal determinants of word association. American Journal of Psychology, 1961, 74, 361-372.

Flavell, J. H.,& Draguns, J. A microgenetic approach to perception and thought. Psychological Bulletin, 1957, 54, 197-217.

Horan, E. M. Word association frequency tables of mentally retarded children. Journal of Consulting Psychology, 1956, 20, 22.

Kagan, J., Rosman, B. L., Day, D., Albert, J., & Phillips, W. Information processing in the child: Significance of analytic and reflective attitudes. Psychological Monographs, 1964, 78, (1, Whole No. 578).

Keilman, P. A.,& Moran, L. J. Association structures of mental retardates. Multivariate Behavior Research, 1967, 2, 35-45.

Kent, G. H., & Rosanoff, A. J. A study of association in insanity. American Journal of Insanity, 1910, 67, 37-96.

Lafall, J. Response faults in word association as a function of response entropy. Journal of Abnormal and Social Psychology, 1955, 50, 265-270.

Levinger, G., & Clark, J. Emotional factors in forgetting word associations. Journal of Abnormal and Social Psychology, 1961, 62, 99-105.

Luria, A. R., & Vinogradova, O. S. An objective investigation of the dynamics of semantic systems. British Journal of Psychology, 1969, 50, 80-105.

Meeker, M. N. The Structure of Intellect: Its Interpretation and Uses. Columbus, Ohio: Charles E. Merrill Publishing Co., 1969.

Moran, L. J., Mefford, R. B., & Kimble, J. P. Idiodynamic sets in word association. Psychological Monographs, 1964, 78 (2, Whole No. 579).

Russell, W. A., & Jenkins, J. J. The complete Minnesota Norms for responses to 100 words from the Kent-Rosanoff word association test. Technical Report No. 11, 1954, University of Minnesota, Contract N80NR-66216, Office of Naval Research.

Silverstein, A. B., & McLain, R. E. Associative processes of the mentally retarded, II: Effects of selected background variables. American Journal of Mental Deficiency, 1964, 69, 440-445.

Wolfensberger, W. Conceptual satiation: An attempt to verify a construct. American Journal of Mental Deficiency, 1963, 68, 73-79.

Table 1

Description of Subjects

	Mean CA (mos.)	Mean IQ	Mean reading grade	Mean PPVT
EMR				
Male				
School G	174	71	3.4	92
School C	175	70	3.2	93
Female				
School G	168	70	3.4	84
School C	176	70	4.2	88
NEMR				
Male				
School G	163	92	3.9	103
School C	175	98	5.6	105
Female				
School G	159	103	4.5	97
School C	176	95	6.3	106

Table 2

H Values for the Stimulus Words[1]

	Word	H Value
1.	Table	1.36
2.	Blossom	2.41
3.	Tobacco	2.87
4.	Spider	3.28
5.	Ocean	3.65
6.	Stove	3.96
7.	Cottage	4.26
8.	Mountain	4.63
9.	Music	4.98
10.	Memory	5.74

1. Based on computations for the Russell-Jenkins norms.

Table 3

Definitions and Reliabilities for the Qualitative Response Categories

Response category	Definition[a]	Example (using stimulus word "table")	W[b]
I. Superior			
A. Supraordinate	Denoting class of which S is a member.	Furniture	.60
B. Subordinate	Denoting a member of the class signified by S.	Work-bench	.84
C. Synonym	Almost exact synonym.	Chart	.80
II. Ordinary			
A. Noun attribute	Noun indicating typical part or function of S.	Leg	.67
B. Coordinate	Object or thing at same level of abstraction as S, i.e., S and R are instances of same conceptual category.	Counter	.48
C. Co-occurrence	R denotes something frequently occurring in same context as S.	Chair	.73
D. Verb attribute	R denotes action that can be performed by or on S.	Eat	.83
E. Adjective attribute	R is adjective that can reasonably modify S.	Wooden	.83
F. Actor	R indicates name of occupation or person closely associated with S.	Carpenter	--

Table 3 (continued)

Response category	Definition[a]	Example (using stimulus word "table")	W[b]
G. Miscellaneous	R related meaningfully to S but cannot be placed in any more specific category.	Cafeteria	.46
III. Inferior			
A. Clang	R physically not semantically related, e.g., alliteration or rhyme.	Label	--
B. Emotional	R expresses affective, evaluative judgment or reaction to S.	Clumsy	--
C. Completion	R completes word or phrase of which S is member. R is usually automatic.	Cloth	--
D. Distant	R unrelated or only very distantly related.	Tomorrow	.62
E. Repetition	Repetition of a previous R or of S.	Table	--
F. Multi-word association	More than one word is used as R.	Dining room	--

[a] S refers to stimulus, R to response.

[b] A blank indicates that the category was used so infrequently that reliability assessment is meaningless.

Table 4

Mean Numbers of Responses per Stimulus Word in Various Subject Groups

	Age	No. Accep.	No. Unaccep.	Log Initial R.T.	Total R.T.	Time/ Response	No. 20" Pauses	Response No. 1st Pause	No. Abrupt Shifts
EMR									
Male									
School G	174.38	18.48	1.48	.50	199.22	11.75	1.05	5.65	7.60
School C	175.50	9.40	1.05	.51	172.72	20.96	.99	4.06	3.98
Female									
School G	167.75	10.94	.61	.56	137.58	19.49	.56	4.31	4.64
School C	176.12	9.16	.62	.43	120.96	18.53	.55	3.90	4.10
NEMR									
Male									
School G	163.13	13.54	.65	.35	164.48	13.74	.90	5.66	5.48
School C	175.50	16.55	.60	.35	165.44	11.36	.91	6.22	6.16
Female									
School G	159.86	17.94	.74	.42	170.06	10.08	..68	5.62	7.52
School C	176.12	17.21	.81	.23	168.22	10.88	1.01	6.70	7.35

Table 5

F Ratios for Quantitative Variables (Age and Vocabulary Size)

	Covariate	df	Acceptable response	Unacceptable response	Log initial	Total response time	Time per response	Number of pauses	First pause	Abrupt shifts
EMR versus	0	1	6.83**	1.88	38.86***	.22	25.72***	.07	2.32	3.18
NEMR	2	1	.61	2.21	26.82***	.21	10.21**	.28	.19	.21
Sex	0	1	.17	1.98	.24	3.53	.23	1.62	..07	.01
	2	1	.04	2.19	0.00	2.52	.03	.85	.07	.45
School	0	1	1.68	.32	7.98**	.57	2.43	.30	.01	1.10
	2	1	3.69	.12	14.55***	2.16	3.46	.02	.94	3.05
EMR x Sex	0	1	3.78	5.06*	.15	4.28*	4.58*	.86	.24	3.05
	2	1	3.11	6.21*	.42	4.70*	4.67*	.72	.09	2.53
EMR x School	0	1	3.96*	.40	.50	.53	4.75*	.17	.89	1.81
	2	1	3.28	.72	1.63	.29	4.85*	.02	.44	1.14
Sex x School	0	1	.29	.65	8.19**	.06	.96	.52	.20	.41
	2	1	.05	.91	12.53***	.00	.78	.25	.02	.11
EMR x Sex	0	1	2.79	.21	.18	.12	4.83*	.03	.04	1.29
School	2	1	3.79	.33	.26	.27	6.20*	.01	.10	1.75
Regression	2	2	5.75**	9.55***	7.74**	12.32***	6.93**	12.89***	10.72***	5.35**
Subjects/groups	0	56	436.281	5.061	.1190	32.003	288.175	5.276	154.056	120.893
(mean sq.)	2	54	373.035	3.877	.0959	22.788	237.816	3.704	114.370	104.640

Table 5 (continued)

	Covariate	df	Acceptable response	Unacceptable response	Log initial	Total response time	Time per response	Number of pauses	First pause	Abrupt shifts
Words		9	13.54***	1.37	10.12***	2.33*	9.79***	1.22	2.98**	4.87***
Words x EMR		9	2.41*	.41	1.52	1.47	1.44	1.39	.51	1.14
Words x Sex		9	2.03*	2.78**	.48	1.61	2.63**	2.33*	3.84***	.75
Words x School		9	1.20	.96	2.26*	1.12	1.33	2.26*	1.01	.84
Words x EMR x Sex		9	1.25	1.70	1.35	1.42	2.30*	3.17**	2.04*	1.19
Words x EMR x School		9	1.24	.53	1.11	1.07	1.90*	.99	.24	.90
Words x Sex x School		9	.92	.38	.87	.29	.40	.98	1.17	.64
Words x EMR x Sex x School		9	.92	1.37	1.16	1.23	1.33	1.94*	2.15*	1.62
Words x Ss/groups (mean sq.)		504	20.962	1.264	.0485	4.092	41.526	.9290	36.851	7.541

*p <.05.

**p <.01.

***p <.001.

Table 6

Means of Superior and Normal Response Categories

	Supra-ord.	Sub-ord.	Syn-onym	Noun attri-bute	Coordi-nate	Co-occur-rence	Verb attri-bute	Adj. attri-bute	Actor	Misc.
EMR										
Male										
School G	.4750	.8250	.1875	2.0875	.6500	4.4625	2.1125	2.2750	.0625	1.9625
School C	.5125	1.1500	.2250	1.4250	.2625	4.4500	2.3125	2.6500	.2125	1.5875
Female										
School G	.3000	.6500	.1875	.9375	.3750	2.9000	1.5250	1.1000	.0375	1.0875
School C	.5125	1.3375	.2500	2.2000	.4750	4.4000	2.2875	2.6750	.2500	1.3125
NEMR										
Male										
School G	.4500	.8875	.2250	1.2250	.3125	4.3125	1.6875	2.3875	.1125	1.0500
School C	.3750	.7375	.2000	.9875	.2000	3.7795	.9250	.4375	.0625	.7000
Female										
School G	.4875	1.0750	.2875	1.5875	.5250	5.4875	2.2625	2.3375	.2875	1.5500
School C	.3625	.5625	.2375	.8000	.3375	2.9125	1.3625	.5375	.0250	.9750

Note.--The data are expressed as mean number of responses in a category per stimulus word.

Table 7

Means of Inferior Response Categories

	Clang	Emotion	Completion	Distant	Repetition	Multi-word
EMR						
Male						
School G	.0000	.6000	.0750	2.7125	1.0625	.4250
School C	.0125	.5000	.0750	1.1625	.5000	.0750
Female						
School G	.0000	.3125	.2625	1.3000	.3625	.2125
School C	.0000	.5625	.1500	.8125	.6750	.1375
NEMR						
Male						
School G	.0000	.3000	.0875	.4500	.2875	.3250
School C	.0125	.0750	.1000	.8375	.4250	.6125
Female						
School G	.0000	.6750	.1750	1.1625	.5125	.2500
School C	.0000	.1375	.0500	.9000	.2375	.3000

Note.--The data are expressed as mean number of responses in a category per stimulus word.

Table 8

Analysis of Variance for Qualitatively Superior and Normal Response Categories

Source	Covariate	df	Supra-ordinates	Sub-ordinates	Synonyms	Noun attribute	Coordinates	Co-occurrence	Verb attribute	Adjective attribute	Actor
EMR versus NEMR	0	1	-5.31*	-11.38**	-3.60	-4.02*	.00	-4.07*	-6.77**	-12.95**	-31.23**
	2		-10.79**	-5.23*	-1.47	.07	.16	.08	-3.30	-3.84	-24.27**
Sex	0	1	.58	.00	1.83	.06	.87	.33	.16	.48	1.54
	2		2.51	.15	2.13	.21	1.68	.06	.30	.23	1.45
School	0	1	.07	.49	.07	.27	3.64	.50	.48	1.29	.17
	2		.81	.02	.22	1.83	5.55*	2.14	.72	1.27	.02
EMR x Sex	0	1	1.33	2.13	.29	9.32**	3.34	2.46	.48	.44	5.18*
	2		3.50	2.21	.35	9.73**	3.43	1.77	..52	.32	6.82**
EMR x School	0	1	.41	1.99	1.17	6.39*	1.58	.02	3.93*	3.59	.38
	2		1.24	1.58	1.14	6.18*	1.29	.18	4.57*	3.98*	.23
Sex x School	0	1	.41	.00	.00	2.88	1.79	.06	.18	.73	1.54
	2		1.41	.06	.00	2.26	1.56	.50	.16	.68	1.99
EMR x Sex x School	0	1	1.05	.00	.65	.46	1.79	.71	2.59	..57	1.07
	2		1.65	.00	.90	.89	2.34	1.46	3.44	.81	1.11
Regression	2	2	27.59**	8.75**	8.72**	10.30**	7.38**	10.21**	9.43**	5.12**	8.13**
Ss/Groups (mean	0	56	.3813	2.467	.0850	6.573	.9484	51.65	10.184	25.088	.1459
(squares)	2	54	.1956	1.933	.0676	4.934	.7725	38.86	7.828	21.871	.1163

Table 8 (continued)

Source	Covariate	df	Supra-ordinates	Sub-ordinates	Synonyms	Noun attribute	Coordinates	Co-occurrence	Verb attribute	Adjective attribute	Actor
Words		9	42.10	46.13	81.90	16.89	11.63	34.94	11.00	14.58	36.19
Words x EMR		9	3.31**	1.55	.68	4.79**	2.21*	1.32	1.72	2.80*	20.11**
Words x Sex		9	1.75	.75	.72	1.21	.73	1.97*	1.49	.98	.97
Words x School		9	.17	.23	.67	.78	1.05	.92	1.19	.41	.24
Words x EMR x Sex		9	1.70	.71	.80	3.46**	.57	1.11	2.71*	.77	1.78
Words x EMR x School		9	.76	.49	2.23*	1.17	.54	1.02	1.04	.91	.70
Words x Sex x School		9	.41	.72	1.24	1.85	.35	1.11	.35	1.58	.71
Words x EMR x Sex x School		9	.86	.37	1.88	1.12	.71	1.33	.63	1.58	.72
Words x Ss/Groups (mean squares)		504	.2018	1.2225	.0872	2.097	.7574	10.44	2.227	3.648	.1596

Note.--F ratios for the EMR variable with negative signs indicate that EMRs give fewer responses in this category than nonEMRs.

*p <.05

**p <.01

Table 9

Analysis of Variance for Qualitatively Inferior Response Categories

Source	Covariate	df	Misc.	Clang	Emotional	Completion	Distant	Repetition	Multiword
EMR versus NEMR	0	1	.63	.00	-4.69*	.00	2.87	.06	4.64*
	2		.00	.73	.05	.19	2.07	.28	5.28*
Sex	0	1	.14	1.71	.25	2.14	.60	1.05	2.30
	2		.01	1.47	1.45	2.87	.38	.98	2.85
School	0	1	1.22	1.71	2.11	1.20	2.24	.67	.06
	2		3.69	1.83	3.99*	2.43	4.44*	.35	.00
EMR x Sex	0	1	.72	.00	2.47	.01	1.80	7.34**	2.09
	2		.51	.00	1.96	.03	2.08	7.82**	2.83
EMR x School	0	1	2.97	.00	3.49	.53	4.27*	5.73*	3.24
	2		2.31	.00	3.43	.42	4.19*	6.71*	3.95*
Sex x School	0	1	.15	1.71	.01	1.49	.10	.95	.01
	2		.01	2.57	.05	2.42	.02	1.10	.03
EMR x Sex x School	0	1	3.91*	.00	2.47	1.20	3.95*	1.40	.45
	2		5.38*	.00	3.81	1.94	5.29*	1.69	.56
Regression	2	2	9.17**	9.00**	8.53**	14.43**	10.71**	4.49**	14.73**
Ss/Groups (mean	0	56	9.469	.0035	1.776	.4201	16.294	2.258	1.254
(squares)	2	54	7.331	.0027	1.399	.2839	12.099	2.008	.841

Table 9 (continued)

Source	Covariate	df	Misc.	Clang	Emotional	Completion	Distant	Repetition	Multiword
Words		9	7.20**	.68	13.26**	10.52**	8.70**	1.48	1.05
Words x EMR		9	1.31	.85	4.24**	2.25*	.83	1.02	.41
Words x Sex		9	1.17	.68	.69	.94	.55	1.61	2.27*
Words x School		9	1.42	.68	2.04*	.85	.21	.80	1.10
Words x EMR x Sex		9	.50	.85	1.91*	1.28	.66	1.52	1.14
Words x EMR x School		9	.67	.85	1.31	1.20	.50	.59	.44
Words x Sex x School		9	.46	.68	.57	.76	.37	.30	.44
Words x EMR x Sex x School		9	1.26	.85	2.30	.79	1.39	.94	1.16
Words x Ss/Groups		504	2.049	.0039	.6301	.2239	3.958	.717	.387

Note.--F ratios for the EMR variable with negative signs indicate that EMRs give fewer responses in this category than nonEMRs.

*p <.05

**p <.01